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THE CHEMICAL PROCESSES FOR THE DETECTION OF ORGANIC SUBSTANCES AND MEDICINAL CHEMICALS.

By L. E. SAYRE, University of Kansas, Lawrence.

THE new (1900) United States Pharmacopœia, which has just been published and officially issued, contains a number of organic compounds which have found their way into medicine and are considered of importance among remedial agents. Among these new agents we find:

Acetone, phenacetin, camphoric acid, trichloracetic acid, ethyl chloride, antipyrine, urethan, benzaldehyde, saccharine, bromoform, chloral formamide, cinaldehyde, cresol, guaiacol, guaiacol carbonate, hexamethylenamine, iodol, salol, safrol, sulfonal, thymol iodide, vanillin, etc.

As it is the province of the pharmacopœia to give approximate tests for identification of the agents made official and to supply methods for the detection of the impurities that may be found in them, it is interesting to note some of these tests.

For this purpose we have selected a few of these organic remedial agents and the tests employed for detection of impurities—those tests that chemists have considered sufficiently reliable to be placed in the hands of any one trained in chemistry. We selected from the list the following organic chemicals and their accompanying tests:

SALOL, OR PHENYL SALICYLATE, $C_6H_4(OH)COOC_6H_5$ 1:2.

This substance is apt to contain, as a result of the process of its manufacture, some uncombined phenol, or a minute quantity of salicylic acid. The test for these impurities is as follows:

If 1 gm. of phenyl salicylate be shaken with 50 c.c. of water, the liquid filtered, and 5 drops of ferric chloride t. s.* previously diluted with 20 volumes of water be added, the filtrate should show either no color or at most a trace (limit of uncombined phenol or salicylic acid).

ANTIPYRINE, $C_3HN_2O(CH_3)_2.C_6H_5$.

Is liable to be contaminated or adulterated with acetanilid and acetphenetidin. The tests which apply to these possible admixtures are as follows:

Two c.c. of an aqueous solution of antipyrine (1 in 100) mixed with an equal volume of nitric acid assumes a yellowish color, passing to crimson on warming (distinction from acetanilid and acetphenitidin).

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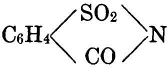
* t. s. = test solution.

On warming 0.1 gm. of antipyrine with sodium hydroxide t. s., and again warming after the addition of chloroform, the disagreeable odor of phenyl-isocyanide should not be developed (absence of acetanilid).

BENZALDEHYDE, $C_6H_5.COH$.

Has been introduced as an article, artificially produced, to take the place of the natural oil of bitter almonds as a material for flavoring. An aqueous or alcoholic solution of either of these may be used in pastry or other material, giving the peach or almond flavor. The objection to the natural oil of almonds, in some cases, is that it contains as a natural constituent hydrocyanic acid. Benzaldehyde will therefore become a popular substitute, for the better, and to guard against adulteration (or substitution) of benzaldehyde by the oil of bitter almonds, a test for the presence or absence of hydrocyanic acid is introduced, which reads as follows:

If ten drops of benzaldehyde, dissolved in a little alcohol, be shaken with a few drops of a strong solution of sodium hydroxide, then with a little ferrous sulfate t. s., and finally mixed with a slight excess of hydrochloric acid, a blue precipitate should not be produced (absence of hydrocyanic acid).



SACCHARINE, $C_6H_4\left\langle\genfrac{}{}{0pt}{}{SO_2}{CO}\right\rangle NH$ (BENZOSULPHINIDE).

May be adulterated with glucose, with benzoic or salicylic acid. These are tested for as follows:

Glucose.—If 0.2 gm. of benzosulphinide be dissolved in 5 c.c. of potassium hydroxide t. s., the solution should be clear, and not become colored, even on prolonged heating (absence of glucose).

Benzoic acid.—If to a hot aqueous solution of benzosulphinide ferric chloride t. s. be added, drop by drop, no precipitation or violet color should appear (absence of benzoic or salicylic acids).

CRESOL (also known as TRICRESOL), $C_6H_4(CH_3)OH$.

This article is a mixture of the three isomeric cresols obtained from coal-tar, an antiseptic of growing popularity. It should be free from hydrocarbons and phenol. The absence of these is detected in the following way:

Hydrocarbons.—If 1 c.c. of cresol be mixed with 1 c.c. of an aqueous solution of sodium hydroxide (1 in 10), it should be dissolved with no appreciable liquid residue (absence of, or limit of, hydrocarbons).

Phenol.—If 1 c.c. of cresol be mixed with 1 c.c. of glycerin, a clear solution should be produced, from which, on the addition of 1 c.c. of water, the cresol should completely separate (absence of, and distinction from, phenol). Phenol forms a perfectly transparent solution with this glycerin and water solvent.

THYMOL IODIDE, $(C_6H_2.CH_3.C_3H_7.OI)_2$.

This article, which has much popularity, is an antiseptic, known by the commercial name of aristol. It should be free from the alkalies, free iodine, and foreign bodies. These are appropriately tested for, but the one test of the pharmacopœia, which will eliminate many of the substitutes that have been marketed for this favorite antiseptic, is the "limit of ash" test, which reads as follows:

If 0.1 gm. of thymol iodide be thoroughly ignited in a porcelain crucible, it should leave not more than 0.003 gm. of residue (limit of ash).

VANILLIN, $(C_6H_3.OH.OCH_3.COH\ 4{:}3{:}1)$.

This expensive, fragrant organic compound is very tempting to the unscrupulous merchant as a substance to be very easily adulterated with such a substance as acetanilid; therefore an appropriate test is found in the pharmacopœia to betray the presence of this adulterant, which reads as follows:

On warming 0.1 gm. of vanillin with concentrated alcoholic solution of sodium hydroxide, adding chloroform, and again warming, it should not give an odor of phenyl-isocyanide (absence of acetanilid).

The author of this paper commented upon the various tests mentioned, and not only showed their importance but gave his personal experience in the employment of them.